AGENT BASED MODELING IN DESIGN MANAGEMENT: BUILDING AGENT PROFILES FOR NEW PRODUCT DEVELOPMENT

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ABSTRACT

Agent-Based Modeling (ABM) methods have been used extensively in different disciplines like ecology, biology and economics. However, applications on agents with smaller boundaries or within an organization are still on early stage of development compared to game-theory-based modelling or system dynamics simulation. The purpose of this work is laying-out a framework for the modeling of the internal and external organizational interactions regarding design outputs in different stages and actors involved in the New Product Development (NPD) process. A refined framework is proposed based on a set of previously validated agents and their interactions were characterized using a semi-structured survey.

INTRODUCTION

Although ABM has been a method used for different systems modeling purposes, it only started to be applied to organizations less than a decade ago when the definitions of environment were expanded, and different topologies were introduced. Regardless of the system and its topology, information is not global, meaning that agents rely on one-on-one interactions get information that ultimately cause them to take action and change the state of its variables. On the classic ABM paradigm and applications, agent boundaries could include a population of individuals (animals, bacteria or plants) or buyers/sellers/brokers in a financial system. However, topologies were non-localized and quantified variables of the population as a whole. Agent Based Simulation (ABS) using frameworks of ABM, found a new application field in organizational behavior when localized phenomena of groups and team started to be quantified and data to be available for analysis. Employee behavior, sales, customer service calls and other quantifiable variables are part of the conversation in the ABM and ABS research communities, even creating a new category called Agent Based Organizational Modeling (ABOM).

SCOPE AND RESEARCH QUESTION

The purpose of this work is to refine the structure and understanding of interactions between agents laid out in a basic topology for New Product Development (NPD) processes, obtained on a previous stage of research. The research question is framed to identify agent attributes, actions and triggers, under different scenarios and knowledge sources.

AGENT BASED MODELING: NEW PRODUCT DEVELOPMENT

Based on information collected from a sample of organizations, the original set of nine agents from the previous research stages were reduced down to five, and a profile for them was constructed on three ABM component criteria: Attributes, Actions and Triggers.

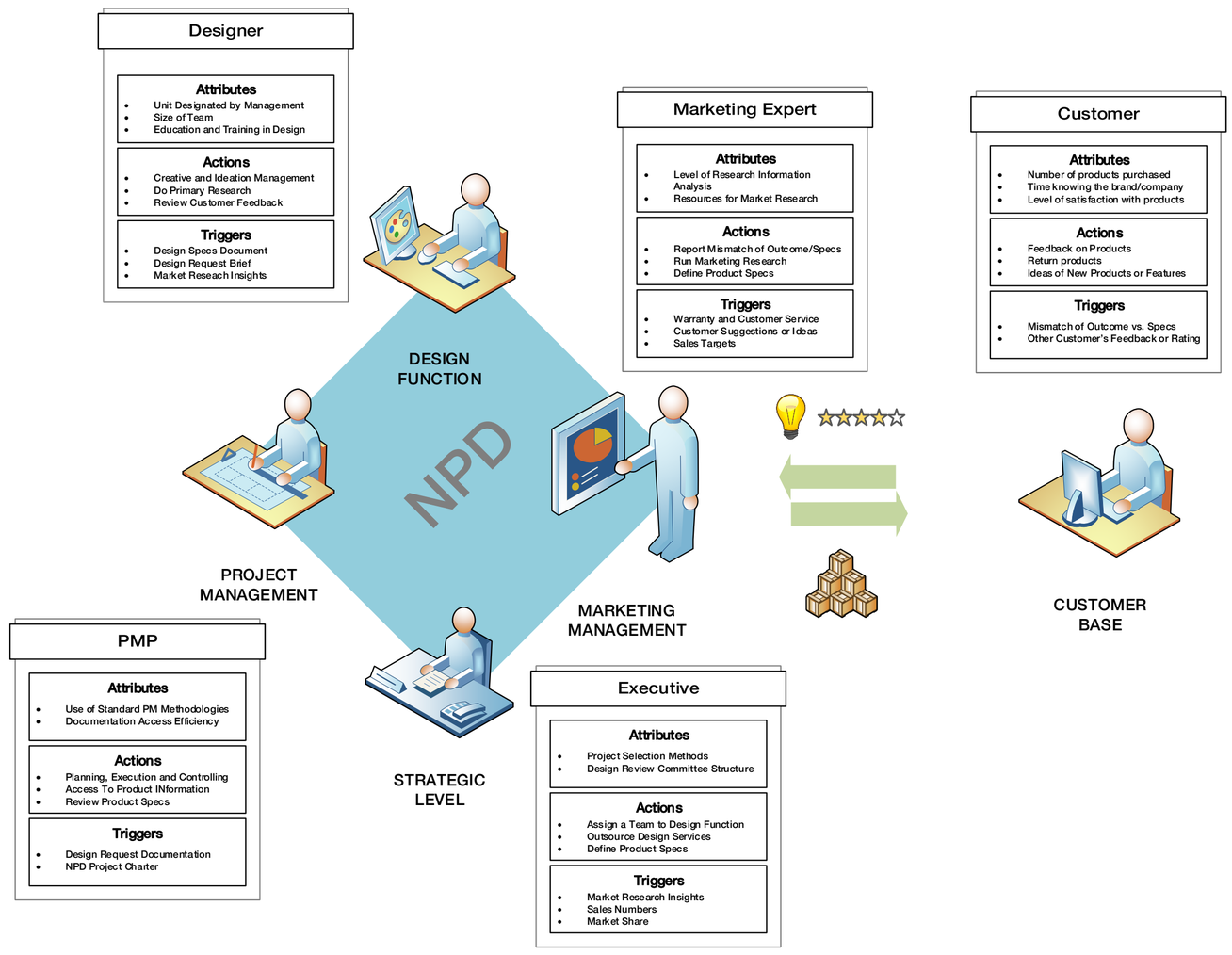

Figure 1 –
Profiles for 5 Agents Identified in the NPD Process

DATA COLLECTION

Data were collected in Summer 2018 using a survey applied to a sample of 21 Colombian Small and Medium Businesses (SMBs) that use intensively or have in-house design services to develop new products. Multiple industries were represented in the sample: Beverages, Retail, Furniture, Textile, Interior Design, and others. This semi-structured survey included 43 questions asking for different design and development processes, actions, responsible teams, steps, protocols, standards, decisions and stages, grouped into 3 main categories: Ideation and Information, Project Management and Product Management. Using categorical and quantitative data, with the open ended questions to provide context, the profiles were built according to each agent's attributes, actions and triggers. This process also allowed to detect redundancies, helping to simplify and reduce the number of agents.

CONCLUSION

The use of data gathered provided a more complete and precise agent profiling, that sets the agent network and variables for the Agent Based Simulation (ABS) stage. Both attribute states and actions/triggers in data collected will become the base for simulation scenarios. Future work will include the validation in multiple scenarios to evidence knowledge flows and organizational decision making.